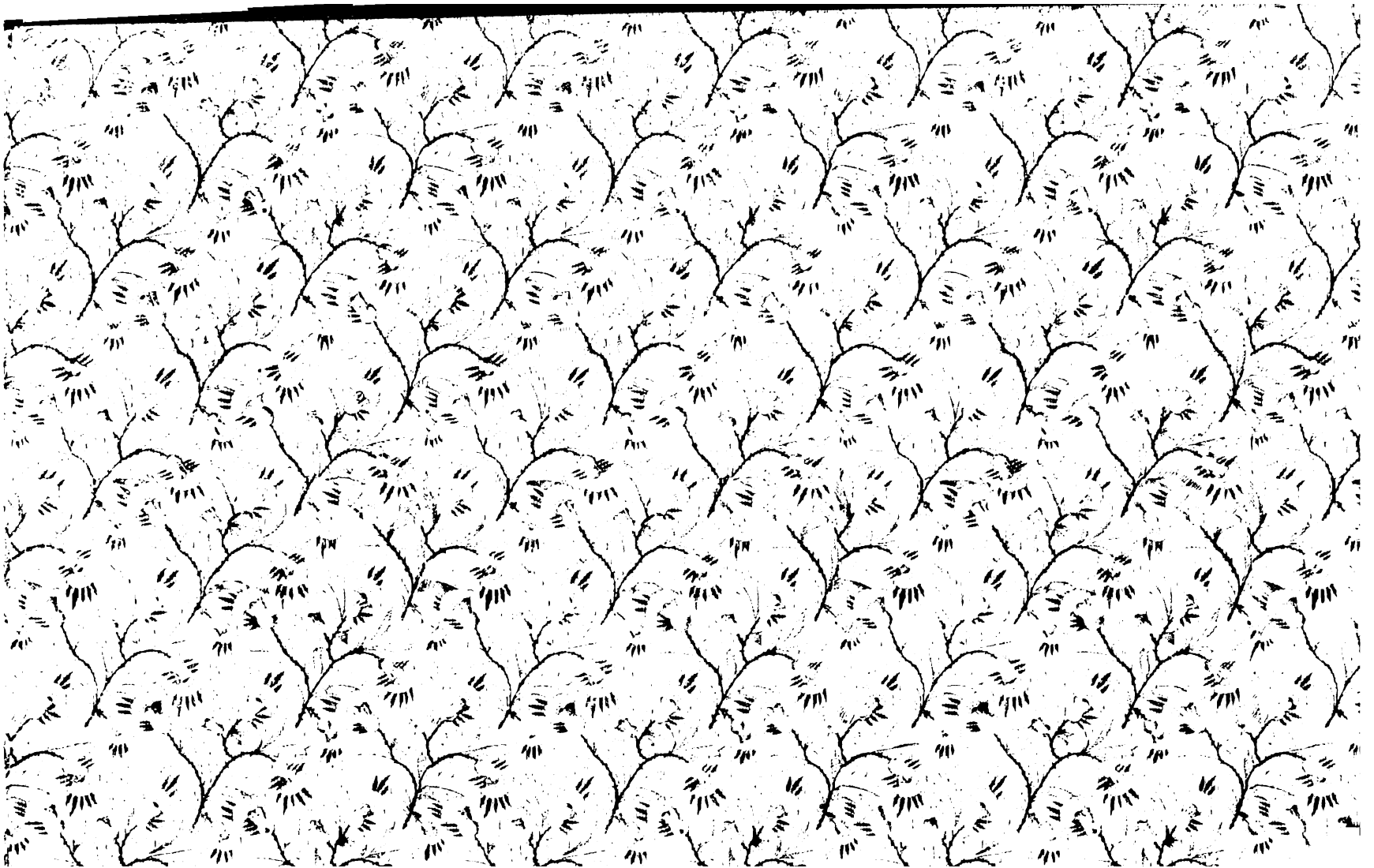


From President Angell
June 7 '89

Compliments
of
W. A. Livingstone.

"The Twenty Foot Channel."

By W. A. LIVINGSTONE.

The Great Lakes Problem:

OR THE

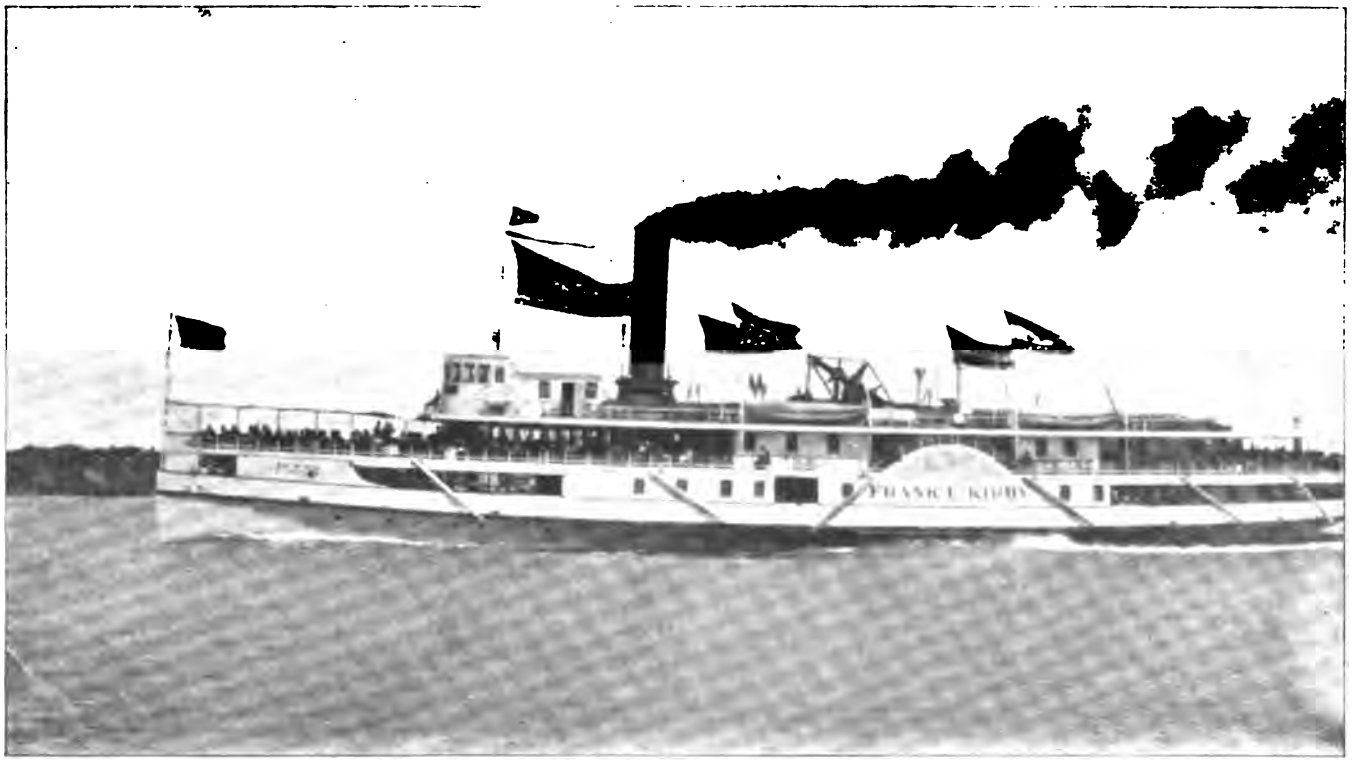
"TWENTY FOOT CHANNEL"

BY

W. A. LIVINGSTONE.

DETROIT, 1891.

THE FASTEST "LAKE" PASSENGER STEAMER.



STEEL STEAMER, FRANK E. KIRBY.

Built by the DETROIT DRY DOCK CO.

PREFACE.

THE object of this pamphlet is to present a few figures showing the magnitude of the service rendered by the Lake Marine and incidentally, its greatest need to-day—a deep-water navigation.

Any unprejudiced person who will study the matter, cannot fail to be amazed at the smallness of the expenditure for "Lake" improvement in proportion to other water improvements when the relative services performed are compared. The cause is not far to seek. "Lake" vessel-men have been entirely too backward in presenting their claims to recognition. As a prominent Government official has justly remarked: "Lake vessel-men rely altogether too much upon the recommendations of the Government officers and do not supplement these recommendations by hard persistent work in demanding their adoption." Vessel-men representing other marine interests well know the value of persistence and insistence in presenting their demands, as the relative appropriations will attest.

Much care has been taken in presenting as accurate figures as possible, and where estimates have been given, conservative results have been used rather than larger figures, which might seem to be justified. It is greatly regretted that the statistical matter could not be presented in the shape of graphical charts.

The writer desires to acknowledge his indebtedness to Mr. Homer J. Carr, of Chicago, for valuable suggestions as to the arrangement of this work, and to the Marine Review of Cleveland, Ohio, through whom most of the vessel cuts were obtained; they having appeared as supplements to that paper. Also, to a large number of gentlemen who aided in giving information as to the figures herein contained.

THE WRITER.

GRAPHIC PRESENTATION OF SOME COMPARATIVE COSTS OF TRANSPORTATION.

Average cost of carrying one bushel of corn from Chicago to Buffalo by "Lake" during the years given:

15.75 cents per bushel in 1859.

10.50 cents per bushel in 1861.

7.50 cents per bushel in 1871.

3.20 cents per bushel in 1881.

1.88 cents per bushel in 1890.

Relative costs of transportation per ton-mile by Rail and by "Lake" during 1890:

Rail rate per ton-mile, 9.41 mills.

Lake rate per ton-mile, 1.2 mills.

Lake rate when Twenty Foot Channel is completed.

THE TWENTY FOOT CHANNEL.

IN the history of the United States, there is no more striking feature than the marvelous internal growth of the country. The factor pre-eminent, in making this growth possible, has been the rapid extension of the transportation systems of the country. Of all the systems, probably none has contributed more to our internal development than the Lake Marine of the Great Northern Lakes. Certainly no route has so modified the direction of permanent development as that of our inland seas. Creating a means of transportation, costing to-day only *one-ninth* the cost of the same service by rail, it has brought the farmer of Minnesota and Illinois in closer proximity to New York than the farmer of southern Ohio. It carries the manufactures of the east one thousand miles west at less expense than the cost of shipping the same goods one-quarter that distance north or south. It has made possible the present splendid development of our Lake Superior mining region. Without its aid many of these iron mines would to-day be unopened. Forcing a population along its routes, which gave birth to such terminii as Chicago and Duluth, and overflowed into the adjacent land, it has reconstructed the geography of the North and West. Great as have been the results accomplished in the past, they are but slight compared to what the Lake Marine will do in the future if properly fostered.

Performing a service greater than that done by one quarter the entire railway freight equipment in the United States, and affecting the freight rates on all the northern trunk lines, the questions relating to its welfare are matters of great public importance. It becomes most pertinent to enquire what results may be expected in the future and what measures must be taken to insure those results. Strange as it may seem, however, these questions have largely been assumed by the public to be of interest only to marine men. The reduction of each cent in the cost of carrying grain

means just so much added to the selling price of the grain at its place of production, and incidentally means a proportionate increase in the value of the land on which the grain was raised. In 1859, it cost an average of 15¾ cents to carry a bushel of corn from Chicago to Buffalo by lake. In 1871, it cost 7½ cents per bushel, and in 1890 it cost 1.88 cents per bushel. In 1867, it cost an average of $4.25 to carry a ton of iron ore from Escanaba to Erie. In 1870, it cost $2.50 for the same service, and $3.00 from Marquette. This year, the rate has been as low as $0.55 from Escanaba, and has averaged for the season $0.823 per ton.

The paramount question relating to the Lake Marine to-day, is the construction of the so-called "Twenty Foot Channel." While the Great Lakes are deep enough for any fleet, the connecting rivers have shoal places limiting the draught of water of the vessels passing through them. As competition has grown sharper upon the "Lakes," vessels have been built larger and larger to obtain cheaper transportation. As they were built longer, they have had to be built deeper in order to give them requisite strength. The result is that all of the larger steamers are compelled to run with less cargo than they are capable of carrying, and, of course, at greater expense per ton of cargo than if they carried full loads. The "Twenty Foot Channel" therefore contemplates the provision of a continuous passage of that depth through the connecting waters between Chicago, Duluth and Buffalo.

Gen. O. M. Poe, in a recent report to the Secretary of War, estimated the cost of such a channel to be (in addition to authorized improvements) $2,379,058, and for a 20 foot channel inside the rivers, but a 21 foot depth in such places as are affected by the sea, a cost of $3,339,567. The latter work was most strongly recommended.

To understand what this improvement means, take the effect on one of the present steamers. This year, the draught of water permissible through the Saint Mary's River has varied from 14 to 14½ feet. Through Lake St. Clair (Grosse Pointe), the draught has varied from 15 to 16 feet. On 14 feet 3 inches draught through the "Soo," the Steamer Maryland would carry about 2,875 net tons of cargo. Were there a 20 foot passage and were she loaded to 19 feet draught, she would carry about 4,550 tons of cargo. This means that where she now carries cargo at $1.00 per ton *free in and out* from Lake Superior on a draught of 14 feet 3 inches, she could then afford to carry cargo at $0.63 per ton on 19 feet draught and still make the same net earnings as she does now at the higher freight. Or, where she

now carries for $1.00 per ton on the "Lower Lakes" on a 16 foot draught, she could then carry for $0 76 per ton and make the same earnings. This is assuming the dispatch in port to be the same in both cases, which undoubtedly would be true by the time this improvement could be completed. Of course, it is an open question whether the Maryland could safely load to 19 feet, but it is certain that she could load safely from two to three feet deeper than at present, and were the draught available, steamers would be built at once which could load to 20 feet and over, thus insuring still greater reduction.

Inasmuch as the class of vessel of which the Maryland is a type practically makes and limits the "gross freight" rates, it can readily be imagined what the effect of such an improvement would be on "Lake" freight rates. Other effects equally important might be pointed out.

There is no water improvement before the country to-day of such urgent necessity nor one whose results would be so far-reaching. No problem, involving so much cheapened transportation, ever presented itself, whose solution was so easy at such a comparatively insignificant cost. The saving effected by it one season would pay its cost many times. The Lake Marine insists on the construction of this work, and the entire Northwest will soon imperatively demand it.

The Saving Effected by the Lake Marine in a Single Season Pays Over Five Times the Total Cost of All Government Improvements to Date.

As will be shown later, the ton-mileage of the Lake Marine for 1890 was 18,849,681,384 ton-miles. The average rate of freight received by the railroads of the United States per ton-mile for the year ending June 30th, 1888, was 10 mills, and for the year ending June 30th, 1889, was 9.22 mills. The rate for 1890 is not yet known, but railroad experts believe it will be a trifle over 9 mills.* Assuming it to be 9 mills, the transportation by rail of the "Lake" cargoes would have cost $169,647,132.

---

*Note.—The report of the Interstate Commerce Commission, which will be issued shortly, will give 9.41 mills per ton-mile as the average rate received by the railroads of the United States for the year ending June 30th, 1890. The highest rate given is 15.61 mills per ton-mile and the lowest, 6.95 mills.

Freight rates on the "Great Lakes" during 1890, varied from 3.5 mills per ton mile to 0.3 mills per ton-mile; the former rate being received on certain high class "package" freight, and the latter being the rate on coal over a certain route. The writer has at hand statements of the freight earnings of several typical vessels engaged in the "gross freight" trade, whose average earnings for the season of 1890 vary from 0.8 mills to 1.0 mill per ton-mile; this rate including such terminal charges as unloading iron ore. The great bulk of the "gross freights" were carried at less than one mill per ton-mile, and it is probable that the average rate on all freights was about 1.1 mills per ton-mile. Assuming however, that it was as high as 1.2 mills, the cost of the total water transportation was $22,619,617.66, or a saving of $147,027,514 over the cost of transporting the same freight by rail. From official figures given in the annual reports of the Saint Mary's Falls Canal, it is shown that the saving by water transportation over rail of the traffic through this canal was $46,138,512 in 1889, and $55,234,648 in 1890, or a total saving of $101,373,160 in two years.

The total expenditures to January 1st, 1891, on the Saint Mary's River (including "New Lock") were $4,170,046.28. It is thus seen that the saving effected by this water-way in two years, paid 2400 per cent. on the total cost to January 1st, 1891, and a large portion of these expenditures, such as those on the Hay Lake Channel and the "New Lock" in the Canal, are for improvements not yet available for shipping. The total cost of all the river and harbor improvements on the "Lakes" to date has been about $29,000,000. The saving in one year of $147,027,514.80, as shown above in the cost of transportation, is over five times the total expenditure for improvement on the "Lakes." Or again, the total expenditures by the United States for harbor and river improvement (all over) from August 1st, 1790, to March 3rd, 1887, was $157,962,762. It is thus seen that the saving effected by the "Lake Marine" in 1890, paid 93 per cent. of all the river and harbor improvements to March 3rd, 1887.

Were the railroads of the United States obliged to do the work of the Lake Marine within the season of navigation (235 days), it would take 42 per cent. of the entire railway freight equipment to do it.

The estimated total Lake Shipments for 1890, based upon known traffic over certain routes, were:

Iron Ore Shipments, as shown later,	9,133,963	Net Tons.
Flour, Grain, Seeds and Milled Products, as shown,	4,846,430	"
Timber, Lumber, and all Forest Products (as equal to the transportation of),	7,885,000	"
Coal Shipments, given later,	6,751,931	"
Salt, Stone and Copper,	766,000	"
All Other Shipments: Manufactures, Pig, Miscellaneous Mdse.,	3,920,000	"
TOTAL SHIPMENTS,	33,303,324	Net Tons.

At $15.00 per ton, the above shipments would be worth $499,549,860.

To appreciate the magnitude of the above figures, rail comparisons are necessary. Were these shipments loaded into railroad trains, the length of the grain and flour trains would be 1652 miles; of the coal trains, 2302 miles; of the lumber and timber trains, 3360 miles; of the iron ore trains, 3892 miles; and of the general merchandise trains, 3000 miles. The total length of all the trains would be 14,206 miles or they would stretch more than half way around the globe. During the 235 days of navigation, it would take 260 large size freight trains leaving every day the various "Lake" ports to transport this freight.

According to the Census Bureau, the average distance that freight was carried on the "Great Lakes" during 1889, was 566 miles. Assuming this distance to be a correct average for 1890 (a reasonable assumption), the total ton-mileage of the Lake Marine for 1890 was 18,849,681,384 ton-miles. The total ton-mileage of all the railroads in the United States for the year ending June 30th, 1889 (last year reported), was 68,727,223,146 ton-miles. The ton-mileage of the Lake Marine was therefore 27½ per cent. of this. In other words, it would require 27½ per cent. of the entire railway freight equipment of the railroads in the United States to have transported by rail the cargoes carried by Lake vessels in 1890; and further, if the railroads had to perform this work during the season of navigation instead of the whole year, it would have taken 42.7 per cent. of the railway equipment.

More Traffic Passes Through the Saint Mary's Falls Canal To-day than Through the Suez Canal.

During the past five years, the growth of the traffic through the Saint Mary's Falls Canal has been most wonderful. In 1886, the net registered tonnage passing through the Suez Canal was 5,767,655 tons, and in 1890, was 6,890,014 tons. In 1886, the net registered tonnage through the Saint Mary's Falls Canal was 4,219,397 tons, and in 1890 was 8,454,435 tons. The latter canal was open only 226 days per year as against 365 days per year for the Suez Canal.

The following figures of the business of the *Saint Mary's Falls Canal* are taken from the official reports prepared under the direction of Gen. O. M. Poe:

YEAR.	TONNAGE PASSED THROUGH.		VALUATION OF	AVERAGE	TOTAL COST OF	NO. OF DAYS
	REGISTERED.	NET TONS ACTUAL FREIGHT.	FREIGHT CARGOES.	HAUL (MILES).	WATER CARRIAGE.	CANAL OPEN.
1886	4,219,397	4,527,759	$69,080,071			226
1887	4,897,598	5,494,649	79,031,757	811.4	$10,075,153	215
1888	5,130,659	6,411,423	82,15,6019	806.9	7,883,077	212
1889	7,221,935	7,516,022	83,73,2527	790.4	8,634,246	234
1890	8,454,435	9,041,213	102,214,948	797.2	9,472,214	228

The cost of per ton-mile of the freight passing through for the past four years (the rate including charges paid by the vessel, such as unloading ore, package frt., etc.) and the value of the fleet using the canal have been:

1887	2.3 mills per ton mile:	$19,773,950	Value of the fleet.
1888	1.5 " "	21,895,400	" "
1889	1.5 " "	26,926,200	" "
1890	1.3 " "	29,635,500	" "

The proportion of cargo tonnage carried by Canadian vessels was 7 per cent. in 1887; 6 per cent. in 1888; and 4 per cent. in 1889.

The ton-mileage of the freight passed through was in round numbers, 5,940,000,000 ton-miles in 1889 and 7,207,000,000 ton-miles in 1890; the latter being an increase of 21 per cent. over the former.

Welland Canal.

The total traffic of actual freight in 1890 through the Welland Canal was 1,016,165 net tons. The quantity of freight passing eastward through the Canal from United States ports to United States ports increased from 96,226 tons in 1881 to 318,259 tons in 1890; the latter being 20,906 tons over 1889.

The Average Vessel on the Great Lakes is Twice the Size of the Average Vessel on our Seaboard.

The average size of the sail vessels on our entire seaboard is 128 gross registered tons per vessel as against 258 tons on the "Lakes." The steamer on the seaboard averages 299 tons as against 428 tons on the "Lakes." Or, taking all the vessels except the canal boats, the average size on the entire seaboard is 165 tons against 349 tons on the "Lakes."

The total vessel tonnage of the United States on June 30th, 1890, as given by the Commissioner of Navigation, was:

	SAILING-VESSELS.		STEAM-VESSELS.		CANAL-BOATS.		BARGES.		TOTAL.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
ATLANTIC AND GULF	13,049	1,542,118	2,800	817,108	440	47,378	1,043	231,989	17,332	2,638,595
PACIFIC COAST	843	238,638	551	183,779	.....	.....	8	5,972	1,402	428,391
NORTHERN LAKES	1,272	328,655	1,527	652,922	657	67,574	54	13,910	3,510	1,063,063
WESTERN RIVERS	.....	.....	1,087	205,276	.....	.....	136	89,169	1,223	294,446
TOTAL	15,164	2,109,413	5,965	1,859,088	1,097	114,953	1,241	341,042	23,467	4,424,497

There is 57 per cent. more steam tonnage on the "Great Lakes" in the class between 1000 and 2500 tons than there is on the entire seaboard. The figures are:

ATLANTIC AND GULF COASTS	157	Vessels,	237,105	Tons.
PACIFIC COAST	28	"	43,001	"
NORTHERN LAKES	272	"	439,787	"
WESTERN RIVERS	22	"	28,588	"
TOTAL	479	"	748,481	"

The Great Lakes Built Forty Per Cent. More Steam Tonnage in 1890 than was Built on the Entire Seaboard.

If we turn to the tonnage built in recent years, the figures are still more flattering to the Lake Marine. The tonnage built during the last four years was:

	1887	1888	1889	1890
WESTERN RIVERS	10,901 Tons.	11,859 Tons.	12,202 Tons.	16,506 Tons.
ENTIRE SEABOARD	83,061 "	105,125 "	111,852 "	169,091 "
NORTHERN LAKES	56,488 "	101,103 "	107,080 "	108,526 "
TOTALS	150,450 "	218,087 "	231,134 "	294,123 "

From which it appears that 30 per cent. of the entire tonnage on the "Lakes" has been built in the last three years. It is also seen that the tonnage built on the "Lakes" in 1888 and 1889 nearly equaled 96 per cent. of that built on the entire seaboard. The *steam tonnage* built in 1890 was:

ATLANTIC AND GULF COAST	155 Vessels.	54,241 Tons.
PACIFIC COAST	57 "	6,896 "
NORTHERN LAKES	116 "	86,023 "
WESTERN RIVERS	82 "	11,888 "
TOTAL	410 "	159,046 "

The average steamer built on the seaboard was 288 tons and on the "Lakes," 760 tons, or over 3½ times the size of the seaboard steamer. The steam tonnage built on the "Lakes" was 40.7 per cent. greater than that built on the entire seaboard.

The estimated value of the United States Lake Marine, as given above, is $62,000,000.00, to which may be added 660 Conadian vessels of about 155,000 tons and having an estimated valuation of $4,300,000.00.

The trend of modern Lake ship building has been in the direction of high class steel freight steamers having a dead weight carrying capacity of 2500 to 3500 net tons. Out of a total steam tonnage of 86,023 tons built on the

"Lakes" in 1890, there were 21 steel steamers aggregating 38,516 gross register tonnage. Already, "Lake" ship-builders are preparing plans for vessels having a cargo capacity of 4000 tons and upwards for "Lake" service.

In connection with "Lake" ship-building, it is interesting to note two achievements of Messrs. F. W. Wheeler & Co. In 1890, they built the steel steamer Mackinaw, having a cargo capacity of about 4000 tons on 22 feet draught, for the salt water trade. After launching her from their yard at West Bay City, Mich., she proceeded to Buffalo with her own power. At Buffalo, she was cut into two sections so she could go through the St. Lawrence River Canals to the sea-board. The sections were towed to Montreal, and there joined together again. This spring, they finished building the Keweenaw, a sister ship to the Mackinaw. She was cut in two on the stocks, just forward of the boiler-room bulkhead and the two sections were launched separately from the stocks. After being towed to the seaboard, the two sections were joined as in the case of the Mackinaw. Both steamers have given good satisfaction as high class ocean "freighters" in the Atlantic trade, and they are now on their way to enter the Pacific trade. Their workmanship and finish have made them admired wherever seen. Great credit is due the builders for their enterprise in supplying a salt water service under so many difficulties.

On November 25th, 1891, the tonnage under construction, and also the tonnage whose future construction was definitely arranged for by the various "Lake" shipbuilders, amounted to 53,087 gross register tons. The cargo capacity of this tonnage will be about 80,000 tons on a draught of 16 feet.

SEA PERFORMANCE OF LAKE STEAMERS.

At very great trouble, the following figures were obtained by the writer, and it is believed that they are fairly representative of our modern fleet.

They were computed from the results of several typical "Lake" steel steamers, equipped with tri-compound engines, and having an average speed of from 12 to 13½ miles per hour, loaded. They represent the average results obtained while running outside, from port to port, under ordinary conditions. It is, perhaps, needless to remark, that on a "picked" trial trip, higher efficiencies are obtained. The cargo capacities of the steamers varied from 2,500 to 3,200 tons on 16 feet draught.

Co-efficient of displacement varied from 0.76 to 0.84.

Average co-efficient of displacement 0.81.

Steam used at 155 pounds gauge pressure; rate of expansion of steam 11½ to 13½.

Consumption of fuel per square foot of grate, 14 to 20 pounds per hour.

Average consumption of fuel per square foot of grate, 17 pounds per hour.

Average consumption of fuel per I. H. P., 1.95 pounds per hour.

Average consumption of water per I. H. P., 17.1 pounds per hour (partly estimated).

Rate of transportation: One ton of freight carried 100 miles on a consumption of from 5¾ to 8 pounds of fuel. Average consumption, 6¾ pounds fuel.

NOTE.—Owing to the small dead-rise in the floors of these steamers, their co-efficient of fineness is very little more than their co-efficient of displacement.

WATER SHIPMENTS OF GRAIN AND FLOUR FROM FIVE PRINCIPAL SHIPPING POINTS DURING 1890.

GRAIN GIVEN IN BUSHELS; FLOUR IN BARRELS.

	FLOUR.	WHEAT.	CORN.	OATS.	RYE.	BARLEY.
CHICAGO	1,757,745	7,030,707	57,529,820	19,016,711	981,710	1,906,961
MILWAUKEE	1,613,728	1,389,714	25,335	424,345	3,159,575	403,556
DULUTH AND SUPERIOR	2,496,000	13,874,707	1,453,010	1,296,738	.....	130,931
TOLEDO	426,523	3,097,468	9,139,959	.....	8,500	.....
DETROIT	432	2,961,378	372,798	18,296	10,540	51,461
TOTAL	6,294,428	28,353,974	68,520,922	20,756,090	4,160,325	2,492,909

The above grain and flour shipments amount to 3,948,430 net tons. Estimated additional shipments of grain and all milled stuffs not included in above statement are 898,000 net tons, making a total shipment by water of all grain and milled products from all lake ports of **4,846,430** *net tons.*

The total quantity of grain carried to tidewater in 1890 by the railroads of New York was 3,045,302 net tons.

NOTE. — Chicago shipments include South Chicago.

WATER SHIPMENTS AND RECEIPTS OF IRON ORE, 1890.

SHIPMENTS.		
MARQUETTE	1,316,353	Gross Tons.
ESCANABA	3,756,143	" "
ST. IGNACE	15,911	" "
ASHLAND	2,109,511	" "
TWO HARBORS	870,848	" "
GLADSTONE	86,558	" "
TOTAL LAKE SHIPMENTS	8,155,324	Gross Tons.
ALL RAIL	848,377	" "
LAKE SUPERIOR PRODUCT	9,003,701	Gross Tons.

The above lake shipments equal 9,133,963 net tons. The shipments for 1890 were 20 per cent. above those for 1889, and 77 per cent. above 1888 shipments.

RECEIPTS.		
TONAWANDA	25,369	Gross Tons.
BUFFALO	551,940	" "
ERIE	487,493	" "
ASHTABULA	2,176,730	" "
FAIRPORT	1,096,408	" "
CLEVELAND	1,945,492	" "
LORAIN	280,450	" "
SANDUSKY	174,596	" "
TOLEDO	164,295	" "
DETROIT	112,272	" "
MILWAUKEE	61,350	" "
CHICAGO	843,505	" "
ALL OTHER PORTS	235,424	" "
TOTAL LAKE RECEIPTS	8,155,324	" "

Competent authorities estimate that the Lake Superior region produced 54 per cent. of all the iron ore mined in the United States in 1887; 58 per cent. in 1888; 60 per cent. in 1889, and 55 per cent. in 1890.

WATER SHIPMENTS AND RECEIPTS OF COAL 1890.

ANTHRACITE.			BITUMINOUS.		
*OSWEGO	450,000	Net Tons.	BUFFALO	5,000	Net Tons.
*CHARLOTTE	400,000	" "	ERIE	203,685	" "
*FAIRHAVEN	130,000	" "	ASHTABULA	452,394	" "
*SODUS POINT	50,000	" "	FAIRPORT	63,360	" "
BUFFALO	2,152,810	" "	CLEVELAND	922 536	" "
ERIE	311,924	" "	LORAIN	227,181	" "
*ALL OTHER PORTS	70.000	" "	HURON	150,000	" "
			SANDUSKY	271,540	" "
TOTAL ANTHRACITE	3 564,734	Net Tons.	TOLEDO	891,501	" "
TOTAL BITUMINOUS	3,187,197	" "			
			TOTAL	3,187,197	Net Tons.
TOTAL COAL	6,751,931	Net Tons.			

RECEIPTS OF COAL.

	1890.		1889.	
CHICAGO	1,266,505	Net Tons.	1,329,364	Net Tons.
MILWAUKEE	903,659	" "	907,743	" "
DULUTH AND SUPERIOR	1,681,525	" "	1,209,000	" "
OTHER LAKE SUPERIOR PORTS	495.405	" "	420,197	" "
*OTHER LAKE MICHIGAN, HURON AND ERIE PORTS	1,504,837	" "	.....	
*OTHER LAKE ONTARIO AND ST. LAWRENCE RIVER PORTS.	900,000	" "	.....	

Note.—Soft coal shipments, except Erie, as given by Cleveland "Marine Review." *Estimated.

ORE RATES FROM THE PORTS NAMED BELOW TO LAKE ERIE PORTS, 1890.

	ESCANABA.	MARQUETTE.	ASHLAND.		ESCANABA.	MARQUETTE.	ASHLAND.
April 10	$1.00	$1.25	$1.35	August 9	$0.85	$1.05	$1.05
April 15	.90	1.20	1.30	August 15	.85	1.00	1.00
May 5	.90	1.15	1.25	October 1	.85	1.00	1.10
May 20	.85	1.15	1.20	October 15	.90	1.00	1.10
May 29	.85	1.10	1.20	November 4	1.00	1.10	1.15
July 20	.85	1.10	1.15	November 12	1.15		1.30
July 24	.85	1.10	1.10	November 25	1.15		1.70
July 30	.85	1.05	1.10				
Average Daily Rates					$0.890	$1.072	$1.156
Season Contract Rates					1.10	1 25	1.35

These rates include the unloading of the ore, paid by the vessel, and are the rates per gross ton.

ORE RATES FROM THE PORTS NAMED BELOW TO LAKE ERIE PORTS, 1891.

	ESCANABA.	MARQUETTE.	ASHLAND.
May 7	$0.70	.....	$0.90
May 11	.....	.....	.90
May 20	[illegible]	[illegible]	.90
July 31	.90	1.10	1.20
August 3	.95	1.15	1.25
August 4	1.10	1.25	1.35
August 6	1.00	1.10	1.20
August 8	.95	1.10	1.15
August 12	.90	1.10	1.10
August 14	.95	1.10	1.15
August 15	1.00	1.15	1.15
August 17	$0.90	$1.10	$1.15
August 20	.90	1.05	1.15
August 29	.85	1.00	1.10
September 1	.90	1.05	1.15
September 4	.95	1.10	1.15
September 5	1.00	1.10	1.15
September 22	1.05	1.20	1.30
September 26	1.00	1.20	1.30
September 29	.95	1.15	1.30
October 1	.95	1.10	1.30
October 3	.90	.....	.....
October 5	.85	1.00	1.20
October 7	.80	1.00	1.10
October 10	.75	.95	1.00
October 12	.75	.85	.95
October 14	.75	.95	1.00
October 22	.80	1.00	1.10
October 30	.90	1.15	1.40
November 4	1.00	1.25	1.50
November 6	1.20	1.30	1.50
November 18	1.30	.....	.....
November 19	1.35	.....	.....
Average Daily Rates			$0.825 / $1.004 / $1.070
Season Contracts made on June 4th			0.65 / 0.90 / 0.90

In the following freight rates, the date on which each rate was established is given, and the rate held good until the succeeding date, when the new rate was made.

Note.—The averages given in all cases are the averages of all the daily rates, and are not the average rates at which the tonnage was carried.

ORE RATES FROM THE PORTS NAMED BELOW TO LAKE ERIE PORTS, 1890.

	ESCANABA.	MARQUETTE.	ASHLAND.		ESCANABA.	MARQUETTE.	ASHLAND.
April 10	$1.00	$1.25	$1.35	August 9	$0.85	$1.05	$1.05
April 15	.90	1.20	1.30	August 15	.85	1.00	1.00
May 5	.90	1.15	1.25	October 1	.85	1.00	1.10
May 20	.85	1.15	1.20	October 15			
May 29	.85	1.10	1.20	November 4			
July 20	.85	1.10	1.15	November 12			
July 24	.85	1.10	1.10	November 25			
July 30	.85	1.05	1.10				
Average Daily Rates							
Season Contract Rates							

These rates include the unloading of the ore, paid by the vessel, and are the rates per gross ton.

ORE RATES FROM THE PORTS NAMED BELOW TO LAKE ERIE PORTS, 1891.

	ESCANABA.	MARQUETTE.	ASHLAND.		ESCANABA.	MARQUETTE.	ASHLAND.
May 7	$0.70	.....	$0.90	August 17	$0.90	$1.10	$1.15
May 11	.65	.....	.90	August 20	.90	1.05	1.15
May 20	.60	$0.80	.90	August 29	.85	1.00	1.10
May 25	.55	.80	.90	September 1	.90	1.05	1.15
June 10	.55	.80	.80	September 4	.95	1.10	1.15
June 22	.60	.80	.80	September 5	1.00	1.10	1.15
June 23	.65	.80	.80	September 22	1.05	1.20	1.30
June 24	.65	.90	.90	September 26	1.00	1.20	1.30
July 7	.65	.90	1.00	September 29	.95	1.15	1.30
July 14	.70	.95	1.00	October 1	.95	1.10	1.30
July 20	.75	1.00	.....	October 3	.90	.....	.....
July 23	.80	1.00	.....	October 5	.85	1.00	1.20
July 24	.85	.95	1.05	October 7	.80	1 00	1.10
July 30	.85	1.05	1.10	October 10	.75	.95	1.00
July 31	.90	1.10	1.20	October 12	.75	.85	.95
August 3	.95	1.15	1.25	October 14	.75	.95	1.00
August 4	1.10	1.25	1.35	October 22	.80	1.00	1.10
August 6	1.00	1.10	1.20	October 30	.90	1.15	1.40
August 8	.95	1.10	1.15	November 4	1.00	1.25	1.50
August 12	.90	1.10	1.10	November 6	1.20	1.30	1.50
August 14	.95	1.10	1.15	November 18	1.30	.....	.....
August 15	1.00	1.15	1.15	November 19	1.35	.....	.....
Average Daily Rates					$0.825	$1.004	$1.070
Season Contracts made on June 4th					0.65	0.90	0.90

RATE OF FREIGHT PER BUSHEL ON CORN FROM CHICAGO TO BUFFALO.

1890.

March 7 ..... 2⅞ cents.	April 30 ..... 1½ cents.	July 24 ..... 1½ cents.	October 16 ..... 1½ cents.
" 14 ..... 3¼ "	May 2 ..... 1¾ "	" 25 ..... 1¾ "	" 22 ..... 1¼ "
" 25 ..... 3½ "	" 8 ..... 1½ "	" 30 ..... 1½ "	" 25 ..... 1½ "
April 3 ..... 3¼ "	" 20 ..... 1¼ "	" 31 ..... 1 "	November 6 ..... 1¼ "
" 5 ..... 2⅞ "	" 27 ..... 1½ "	August 1 ..... 1¼ "	" 18 ..... 1½ "
" 11 ..... 2½ "	June 5 ..... 1¾ "	" 9 ..... 1⅜ "	" 19 ..... 1¾ "
" 14 ..... 2¼ "	" 10 ..... 2 "	" 16 ..... 1¼ "	" 20 ..... 1½ "
" 15 ..... 2 "	" 27 ..... 2¼ "	September 5 ..... 1½ "	" 21 ..... 2 "
" 25 ..... 1¾ "	" 28 ..... 2⅛ "	" 12 ..... 1¾ "	" 28 ..... 3 "
" 26 ..... 1½ "	July 8 ..... 2 "	" 29 ..... 2 "	December 3 ..... 3 "
" 28 ..... 1¼ "	" 23 ..... 1⅞ "	October 14 ..... 1⅞ "	

1891.

April 10 ..... 2 cents.	July 28 ..... 2¼ cents.	September 12 ..... 3 cents.	October 31 ..... 2¾ cents.
" 17 ..... 1¾ "	" 30 ..... 2¾ "	" 15 ..... 3¼ "	November 4 ..... 3¼ "
May 2 ..... 1½ "	" 31 ..... 3 "	" 25 ..... 3 "	" 5 ..... 3¾ "
" 8 ..... 1¼ "	August 7 ..... 2¾ "	" 28 ..... 2¾ "	" 6 ..... 4 "
" 9 ..... 1⅛ "	" 10 ..... 2½ "	" 30 ..... 2½ "	" 12 ..... 3¾ "
" 13 ..... 1 "	" 11 ..... 2¼ "	October 3 ..... 2¼ "	" 19 ..... 4½ "
June 29 ..... 1¼ "	" 14 ..... 2½ "	" 5 ..... 1¾ "	" 21 ..... 4¼ "
July 7 ..... 1¾ "	September 2 ..... 2¾ "	" 23 ..... 2 "	" 28 ..... 4½ "
" 13 ..... 1½ "	" 4 ..... 3 "	" 26 ..... 2¼ "	December 2 ..... 4½ "
" 14 ..... 1¾ "	" 10 ..... 3¼ "	" 30 ..... 2½ "	

AVERAGES OF DAILY RATES FOR THE PAST SIX YEARS.

1886 ..... 3.4 cents per bushel.	1888 ..... 2.5 cents per bushel.	1890 ..... 1.88 cents per bushel.
1887 ..... 3.9 " "	1889 ..... 2.25 " "	1891 ..... 2.13 " "

RATE OF FREIGHT PER BUSHEL ON WHEAT FROM DULUTH TO BUFFALO.

1890.

March 28	3¾ cents.	June 8	2¾ cents.	June 27	2½ cents.	November 15	3 cents.
April 11	3½ "	" 5	2½ "	July 8	2¾ "	" 22	4 "
" 28	3¼ "	" 13	2¼ "	" 10	2½ "	" 24	4½ "
May 7	3 "	" 14	2 "	" 30	2¼ "	" 26	5 "
" 10	2¾ "	" 21	2½ "	September 15	2½ "	" 28	5½ "
" 13	3 "	" 24	2¾ "	" 22	2¾ "		

1891.

March 16	2⅞ cents.	June 18	2 cents.	October 6	3¼ cents.	November 6	6 cents.
" 18	2¾ "	July 7	2¼ "	" 8	3 "	" 7	7 "
" 24	2½ "	" 13	2½ "	" 10	2½ "	" 9	7½ "
April 22	2¼ "	August 1	3 "	" 19	2¾ "	" 19	8 "
May 9	2 "	" 5	3½ "	" 20	3 "	" 20	8½ "
" 16	1¾ "	" 6	3¼ "	" 21	3½ "	" 21	9¼ "
" 18	1½ "	September 8	3½ "	" 26	4 "	" 23	9½ "
" 20	1¼ "	" 10	3¾ "	November 2	4¼ "	" 25	9¼ "
June 9	1¾ "	" 15	4 "	" 3	5 "	" 28	9¼ "
" 12	1½ "	" 28	3½ "	" 5	5¼ "		

Average Daily Rate in 1890 ..... 2.8 cents per bushel.

" " " " 1891 ..... 3.15 " " "

SOME FREIGHT RATES FOR 1890 AND 1891.

In the following freight rates, the date on which each rate was established is given, and the rate held good until the succeeding date, when the new rate was made.

RATES PER NET TON FOR CARRYING COAL FROM BUFFALO TO THE PORTS NAMED.

1890.			
	DULUTH.	MILWAUKEE.	CHICAGO.
April 16	$ 0.40	$ 0.40	$ 0.40
April 21	.35	.50	.50
April 30	.35	.50	.60
May 5	.40	.50	.60
May 21	.35	.50	.60
June 13	.40	.50	.60
September 3	.30	.50	.60
November 3	.40	.60	.75
November 9	.60	.60	.75
November 11	.75	.75	.75
November 28	.75	.75	1.00
Average Rate	$ 0.394	$ 0.521	$ 0.611

1891.			
	DULUTH.	MILWAUKEE.	CHICAGO.
April 14	$ 0.40	$ 0.50	$ 0.60
May 11	.40	.60	.60
July 18	.40	.50	.50
July 20	.30	.50	.50
August 12	.40	.50	.50
August 28	.30	.50	.50
September 2	.30	.40	.40
September 15	.25	.40	.40
September 26	.25	.50	.50
October 28	.25	.50	.60
October 29	.25	.60	.60
November 10	.10	.60	.60
November 18	.10	.75	.75
November 28	.10	1.00	.75
Average Rate	$ 0.318	$ 0.545	$ 0.557

Note. —The averages given in all cases are the averages of all the daily rates, and are not the average rates at which the tonnage was carried.

STEAMSHIP OWEGO.

The Steamship Owego was built in 1887 by the Union Dry Dock Company, of Buffalo, for the Union Steamboat Company. She is built of steel with the usual double bottom containing water ballast. Her dimensions are:

Length over all	350	feet,	7	inches.
" Keel	324	"	10	"
Extreme Beam	41	"	2	"
Molded Depth	25	"	6	"

Built by the UNION DRY DOCK CO.

She has tri-compound engines with cylinders, 28, 42½, and 72 inches in diameter by 54 inches stroke and indicating 2600 horse power. Steam is supplied by six boilers, each 11 feet 6 inches diameter by 11 feet 6 inches long. Her total grate surface is 240 square feet. She has a sectional screw wheel 15 feet 6 inches diameter by 21 feet of periphery pitch.

Her record of time between Chicago and Buffalo, of which the sailing distance is 892 miles, is 54 hours 15 minutes, or an average of 16.44 miles per hour.

NOTE.—The engines of all Lake steamers are jet condensing. All modern steamers are supplied with steam steerers, steam capstans and windlasses, and many have elaborate electric lighting plants, and similar conveniences.

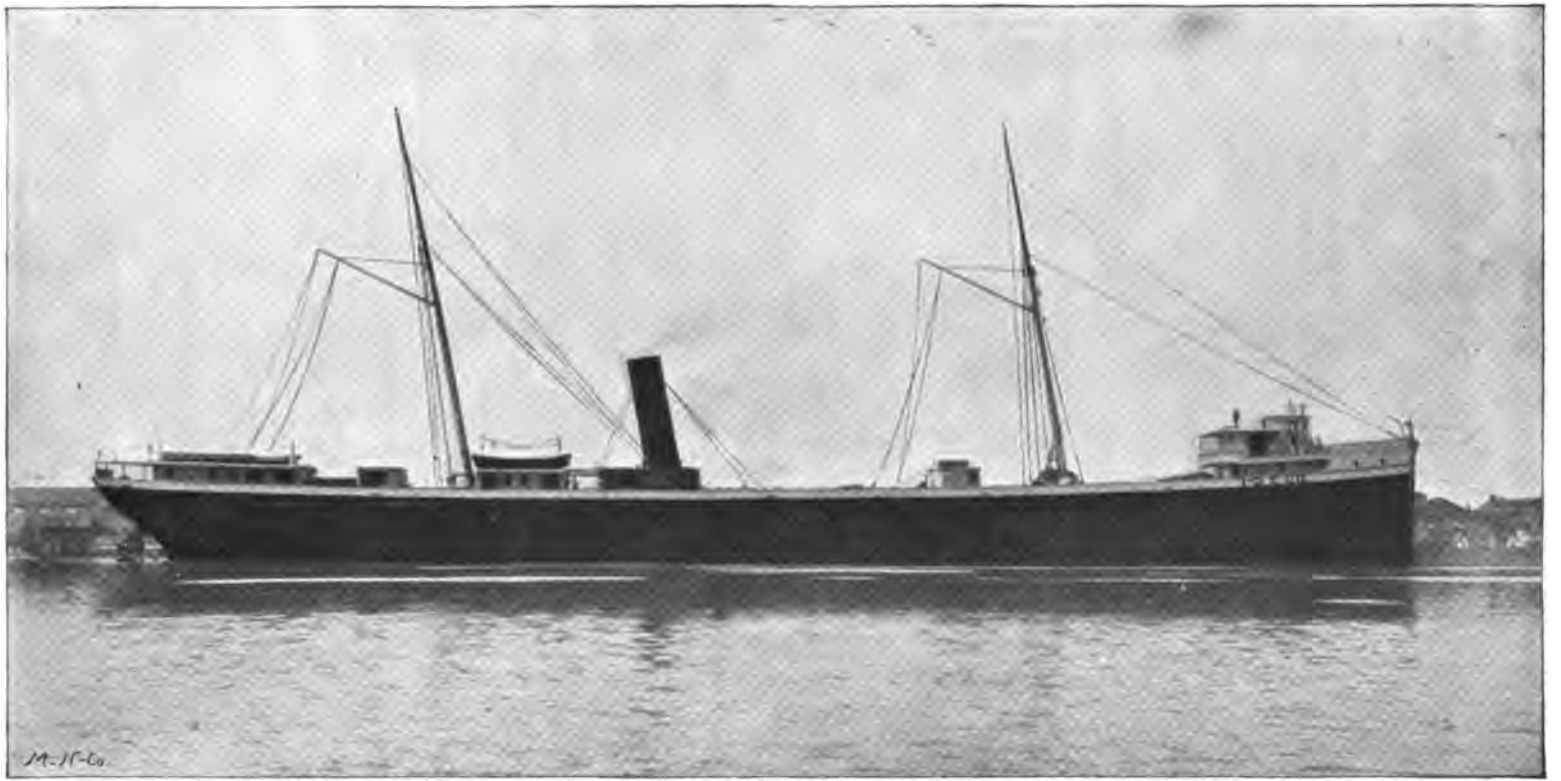
MARYLAND.

The Steamship Maryland was built of steel in 1890, by the Detroit Dry-Dock Company, for the Inter-Ocean Steamship Co. She has a double bottom, holding 1,200 tons of water ballast. Her dimensions are:

Length over all	334	feet	6 inches.
" Keel	316	"	0 "
Extreme Beam	42	"	0 "
Molded Depth	24	"	0 "

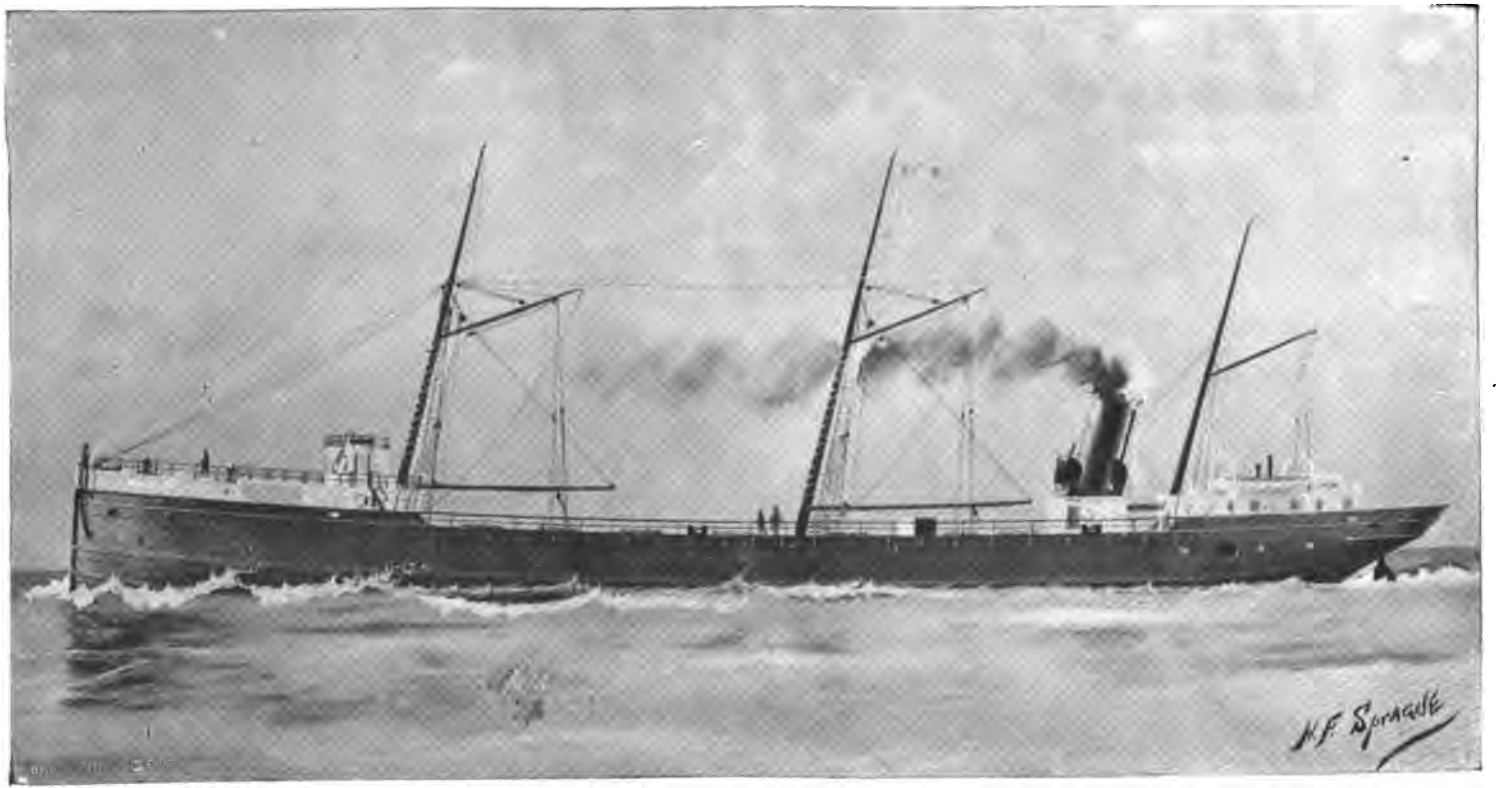
She has tri-compound engines, with cylinders 22, 35 and 56 inches diameter by 44 inches stroke, indicating 1,400 horse-power. A working steam pressure of 160 pounds (gauge) is supplied by two boilers of "Scotch" type; each 14 feet 2 inches in diameter by 11 feet 6 inches long. The grate surface is 152 square feet. She has a sectional screw wheel 13 feet 2 inches in diameter, with a periphery pitch of 16 feet 0 inches. Her speed, loaded, is 13¼ miles per hour.

During the 127 days she was in commission in 1890, she carried 29 cargoes of iron ore between Escanaba and South Chicago, aggregating 92,749 gross tons, or an average of 3,198 gross tons per cargo. Her largest load was 3,720 net tons of ore, and her load on a 16 feet draught was 3,475 net tons, excluding fuel.



STEAMSHIP MARYLAND.

Built by the DETROIT DRY DOCK CO.



STEAMSHIP AMERICA.

Built by the UNION DRY DOCK CO.

AMERICA.

The Steamship America was built in 1889 by the Union Dry Dock Company, of Buffalo, for a Buffalo syndicate. She is built of steel, with a double bottom holding 600 tons of water ballast. Her principal dimensions are:

Length over all	293	feet	0 inches.
" of Keel	275	"	0 "
Extreme Beam	40	"	2 "
Molded Depth	24	"	0 "

She has a "fore and aft" compound engine with cylinders 28 and 50 inches in diameter by 48 inches stroke, indicating 950 horse-power. Steam is supplied by two boilers of Scotch pattern, each being 12 feet in diameter by 11 feet 6 inches long, having 108 square feet of grate surface. Her screw wheel is 12 feet 4 inches in diameter by 15 feet periphery pitch. Her speed loaded is from 11½ to 12 miles per hour. In 1890 she carried 111,507 bushels or 3,121 net tons of corn out of Chicago on a draft of 16 feet 5 inches.

COLGATE HOYT.

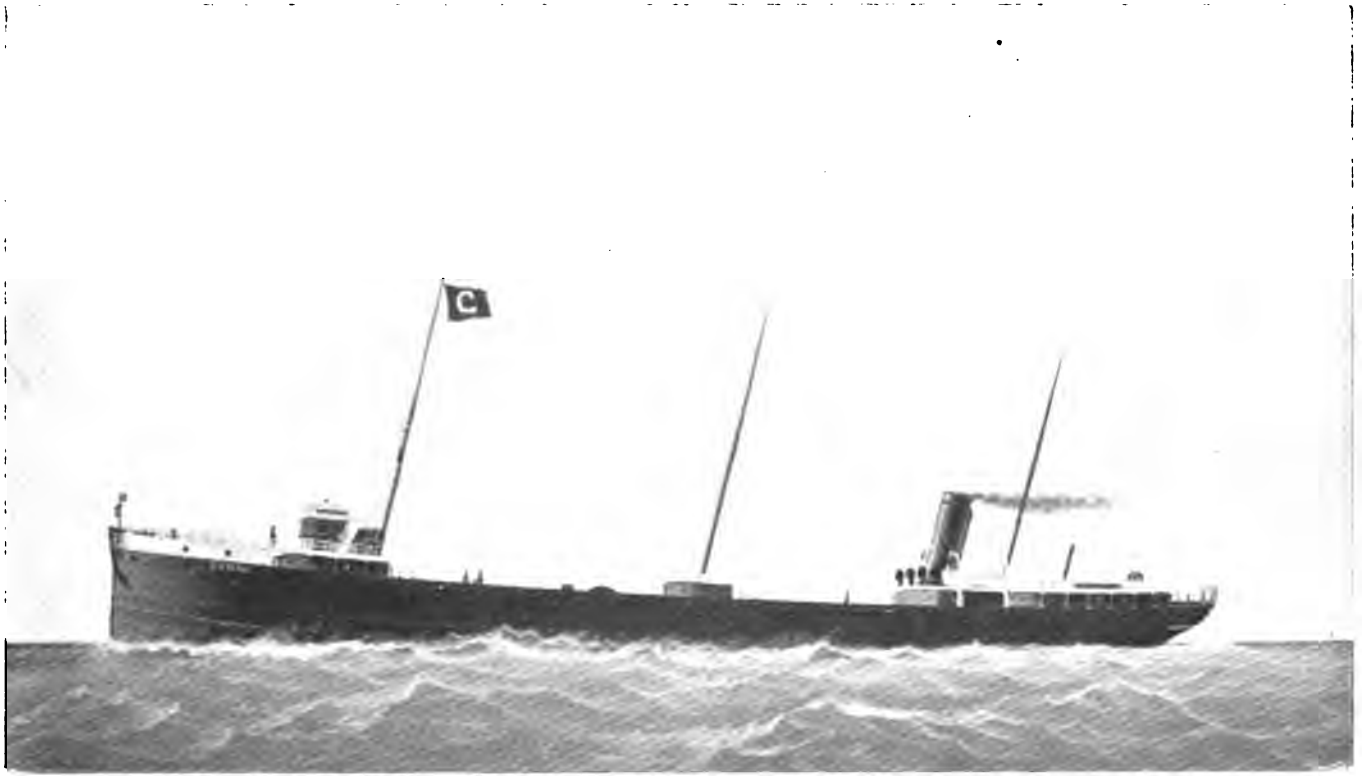
The Steamer Colgate Hoyt was built in 1890 by Alexander McDougall, at Duluth, for the American Steel Barge Company, and was the first of the "whaleback" steamers. She is built of steel on the system popularly known as "McDougall's patent whaleback construction." Her double bottom holds 500 tons of water ballast. Her dimensions are:

Length over all	284	feet 0	inches.
" Keel	265	" 0	"
Extreme Beam	36	" 0	"
Molded Depth	22	" 0	"

She has a "fore and aft" compound engine built by S. F. Hodge & Company, of Detroit, indicating 900 horse-power. The cylinders are 26 and 50 inches diameter by 42 inches stroke. She has two boilers, 11 feet diameter by 11 feet long, having 90 square feet of grate surface. Her speed loaded is 11½ miles per hour. She carries 2,850 net tons of cargo on a draught of 16 feet of water.

A sister ship, the Chas. W. Wetmore, having two feet more beam and two feet more depth, was built this spring by the same company. Being too long to go through the St. Lawrence River canals, she was sent down over the Rapids light. Arriving at Montreal, she loaded a cargo of wheat, which she safely delivered in Liverpool after a passage of 14 days. On her return she left for the Pacific coast, which she will reach in a few days.

STEAMER COLGATE HOYT (WHALEBACK).



STEAMSHIP PONTIAC.

Built by the CLEVELAND SHIP BUILDING CO.

PONTIAC.

The Steamship Pontiac was built in 1889 by the Cleveland Ship-Building Company, for the Cleveland Iron Mining Company. She is steel, with a double bottom containing 650 tons of water ballast. Her dimensions are:

Length over all	318	feet	0	inches.
" of Keel	300	"	0	"
Extreme Beam	40	"	0	"
Molded Depth	25	"	0	"

She has tri-compound engines with cylinders 24, 38 and 61 inches in diameter by 42 inches stroke, indicating 1,450 horse-power. Steam is supplied at 160 pounds (gauge) pressure by three boilers, each 11 feet 6 inches diameter by 14 feet 0 inches long. The total grate surface is 142 square feet. She has a sectional screw wheel 13 feet 6 inches in diameter by 17 feet 0 inches periphery pitch. Her speed loaded is 13 miles per hour. Her largest load, in 1890, was 3,249 net tons ore.

On July 14th, 1891, she was sunk by collision with the Steamer Athabasca in the St. Mary's River. She was raised in September, and, after undergoing very extensive repairs, is now ready for service again.

E. C. POPE.

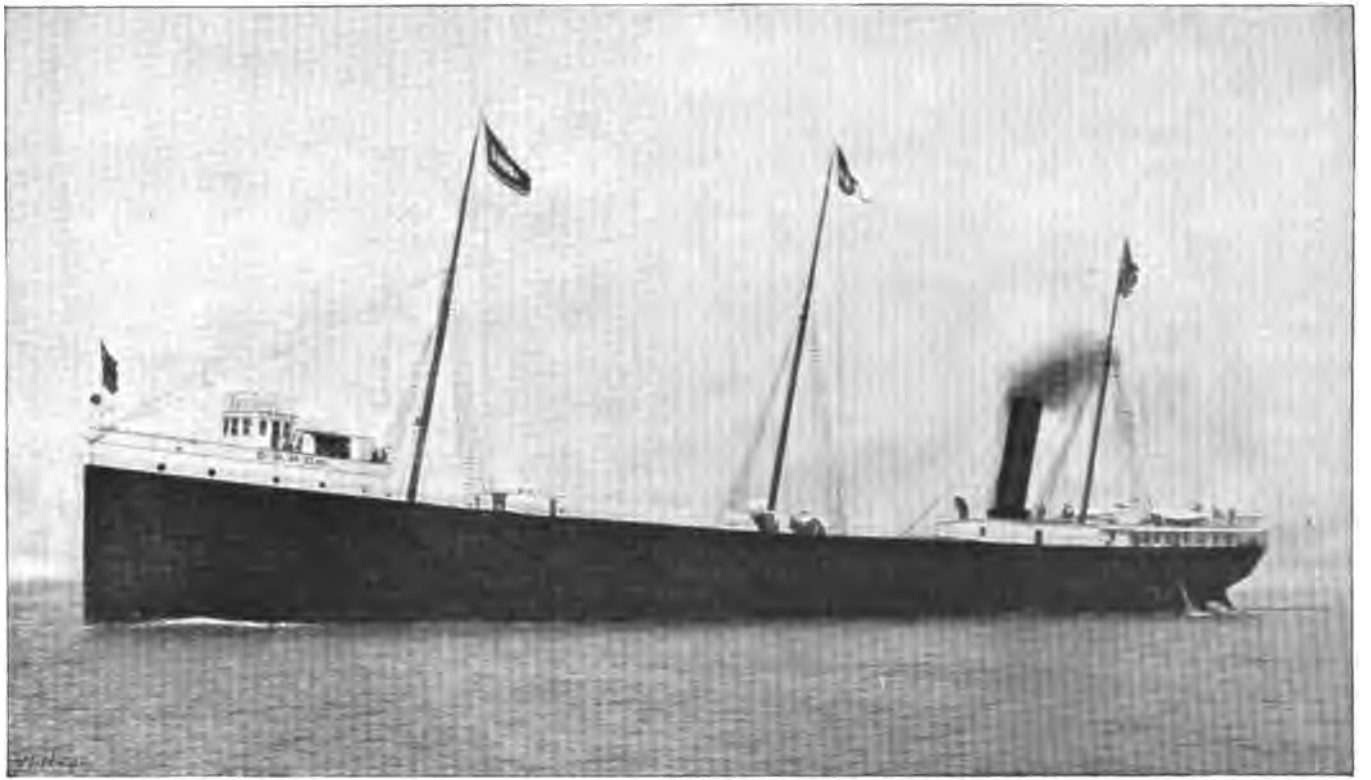
The Steamship E. C. Pope was built in 1891 by the Detroit Dry Dock Company, for the Dry Dock Navigation Co. Her dimensions are:

Length over all	334	feet,	6	inches.
" Keel	316	"	0	"
Extreme Beam	42	"	0	"
Molded Depth	24	"	0	"

She is built of steel with a double bottom holding 950 tons of water ballast.

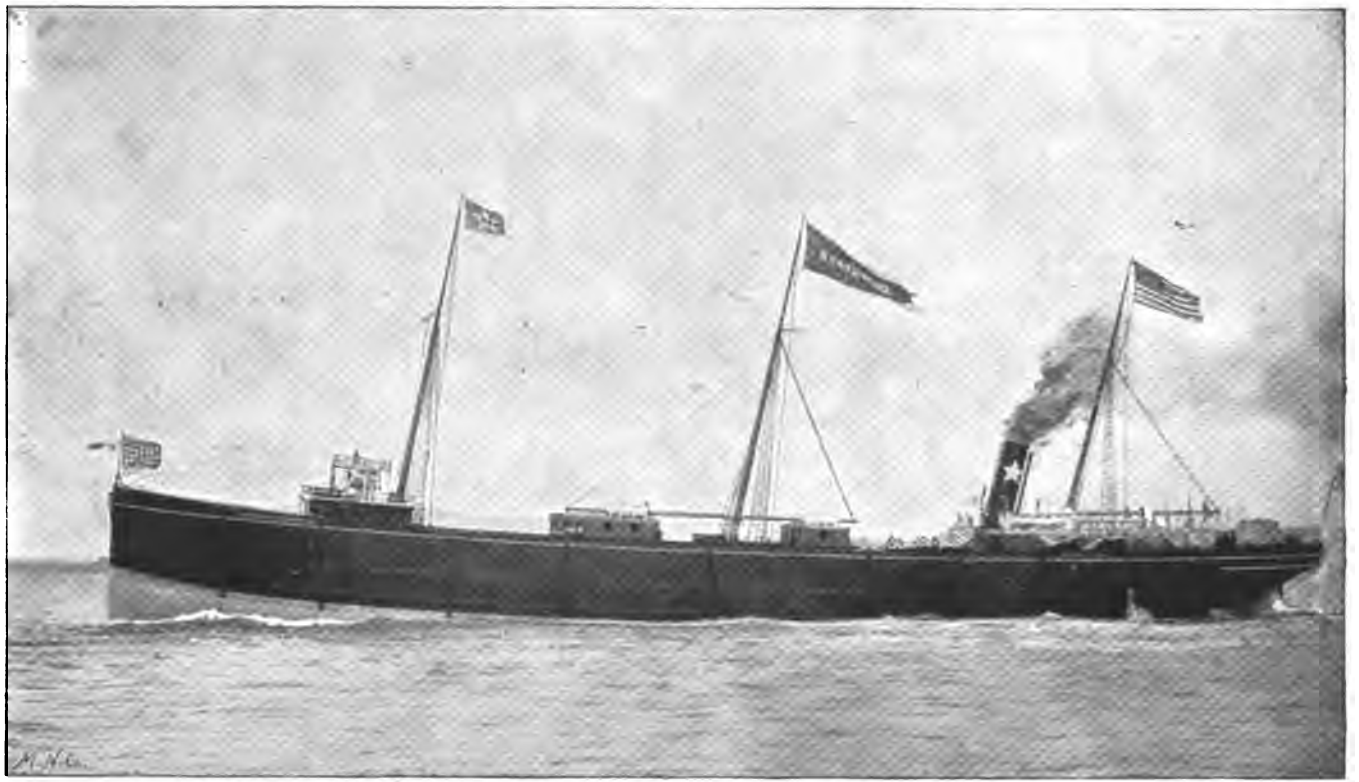
She has tri-compound engines with cylinders 22, 35, and 56 inches in diameter by 44 inches stroke and indicating 1,400 horse-power. A working steam pressure of 160 pounds (gauge) is supplied by two boilers of Scotch type, each 14 feet 2 inches diameter by 11 feet 6 inches long. The total grate surface is 152 square feet. She has a sectional screw wheel, 13 feet 2 inches in diameter by 16 feet 6 inches periphery pitch. Her speed, loaded, is 13½ miles per hour.

She has carried 104,000 bushels of wheat from Duluth, on a draught of 14 feet 6 inches, and 125,990 bushels of corn from Chicago, on a draught of 15 feet 9 inches. She is expected to carry 3,830 net tons of cargo on 16½ feet.



STEAMSHIP E. C. POPE.

Built by the DETROIT DRY DOCK CO.



STEAMSHIP NORTH WIND.

Built by the GLOBE IRON WORKS CO.

NORTH WIND.

The Steamship North Wind was built in 1888, by the Globe Iron Works Co., Cleveland, Ohio, for the Northern Steamship Co. She is built of steel, with a double bottom, containing 800 tons of water ballast. Her dimensions are:

Length over all	312	feet	0 inches.
" Keel	292	"	0 "
Extreme Beam	40	"	0 "
Molded Depth	24	"	" "

She has tri-compound engines, with cylinders 24, 38 and 61 inches diameter by 42 inches stroke, indicating 1,300 horsepower. Steam is supplied at 160 pounds (gauge) pressure, by two boilers (Scotch type), each 14 feet 0 inches diameter by 12 feet 6 inches in length. Total grate surface, 132 square feet. She has a sectional screw wheel, 14 feet 0 inches diameter by 16 feet periphery pitch.

Her speed, loaded, is 13 miles per hour. Her dead-load capacity is 3,000 net tons on 16 feet draught of water.

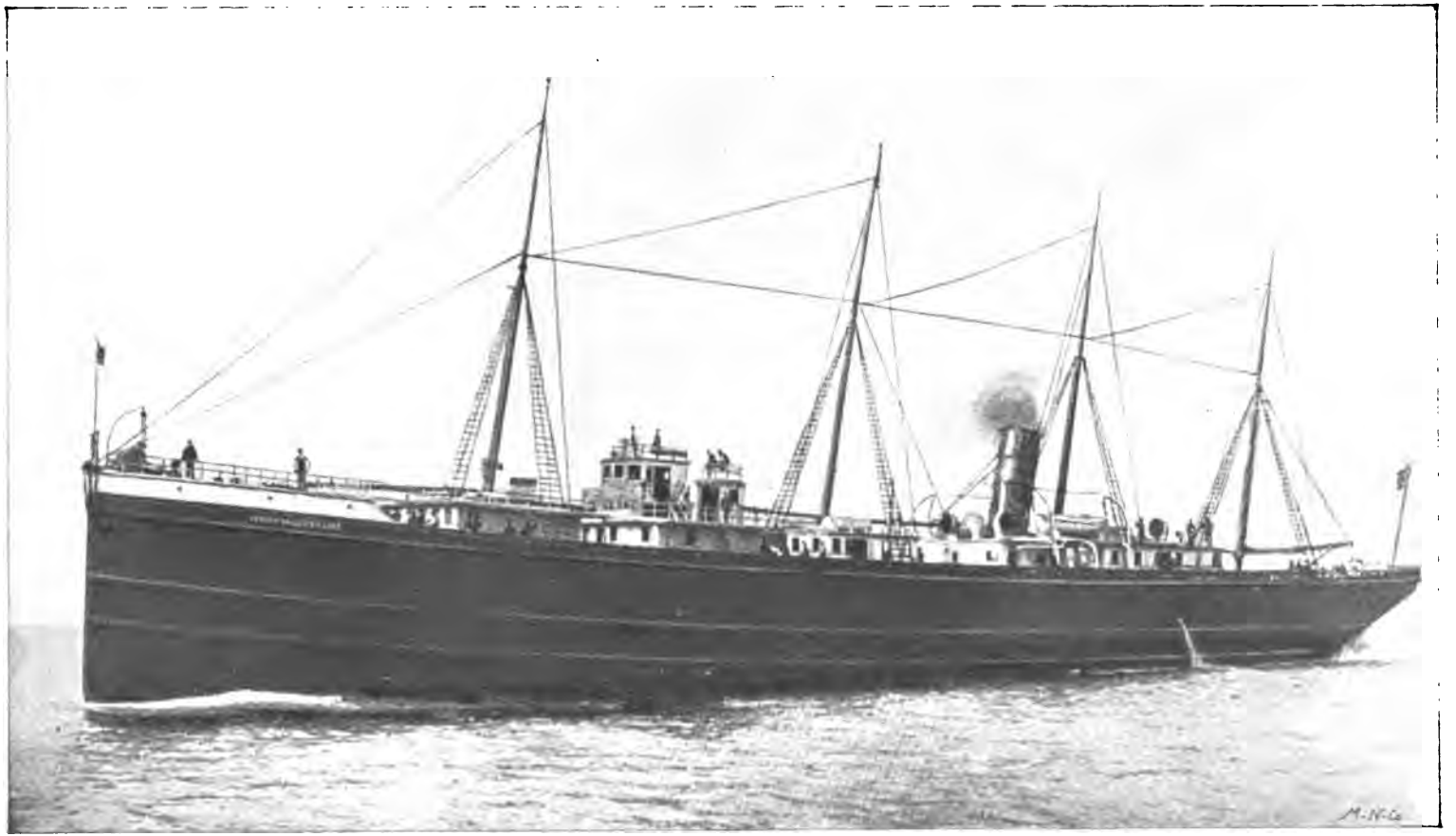
TUSCARORA.

The Steamship Tuscarora was built in 1890, by the Globe Iron Works Company, of Cleveland, for the Lehigh Valley Transportation Co. She is built of steel with a double bottom holding 800 tons of water ballast. Her dimensions are:

Length over all	308	feet,	8	inches.
" Keel	292	"	2	"
Extreme Beam	40	"	0	"
Molded Depth	25	"	6	"

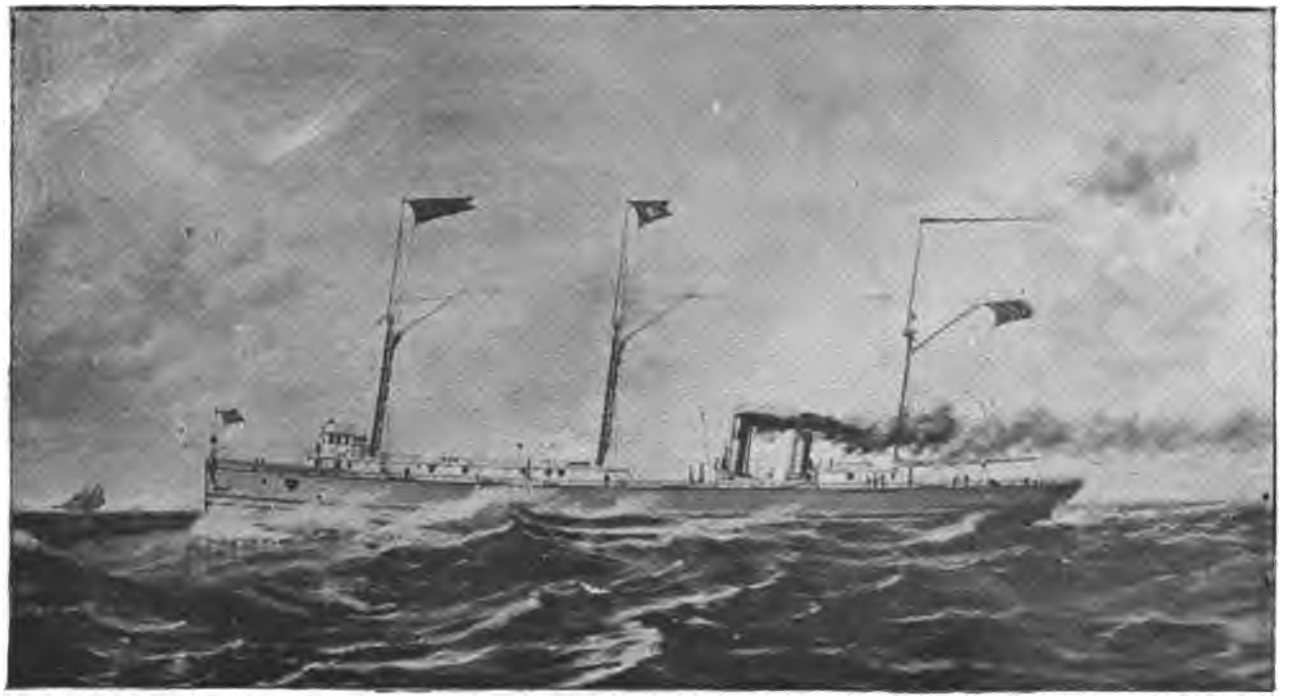
She has tri-compound engines with independent Worthington condenser and air pump. The cylinders are 24, 38, and 61 inches diameter by 42 inches stroke, indicating a total of 1,650 horse-power. Steam is supplied at 160 pounds (gauge) pressure by three boilers (Scotch type) each 12 feet 6 inches in diameter by 12 feet 0 inches long. Total grate surface, 162 square feet. She has a sectional screw wheel, 24 feet 0 inches diameter by 17 feet 6 inches periphery pitch.

Her speed, loaded, is 14 miles per hour, and light, 15½ miles per hour. Her dead-load capacity is 2,650 net tons on 16 feet draught of water.



STEAMSHIP TUSCARORA.

Built by THE GLOBE IRON WORKS COMPANY.



STEAMSHIP HARLEM.

Built by the DETROIT DRY DOCK CO.

HARLEM.

The Steamship Harlem was built in 1888 by the Detroit Dry-Dock Company, for the Western Transit Company, to run in the "package freight" trade. She is built of steel, with a double bottom, containing 600 tons of water ballast. Her dimensions are:

Length over all	304	feet	0 inches.
" Keel	285	"	0 "
Extreme Beam	41	"	0 "
Molded Depth	28	"	0 "

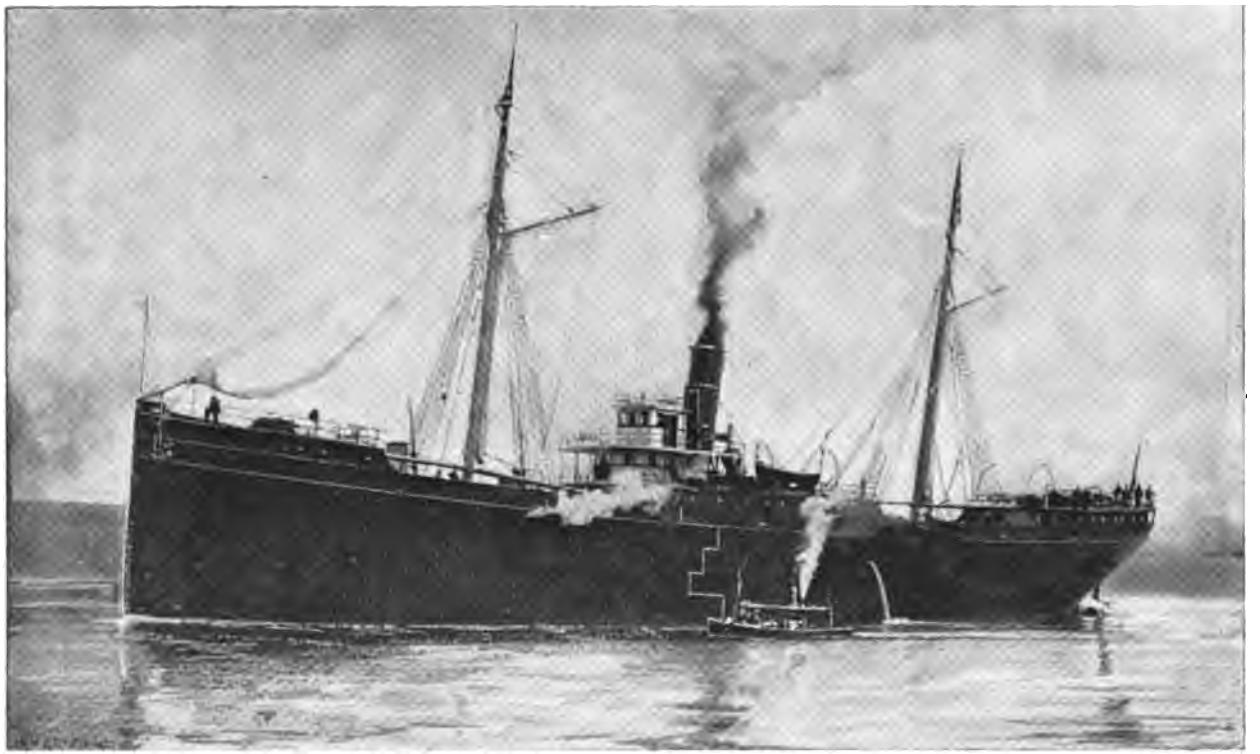
She has tri-compound engines, with cylinders 23, 36 and 62 inches in diameter by 48 inches stroke, indicating 1,650 horse-power. Steam is supplied by two "double-ended" boilers of Scotch pattern; each boiler being 11 feet 6 inches diameter by 18 feet 6 inches long. The total grate surface is 168 square feet. She has a sectional screw wheel 13 feet 6 inches diameter by 18 feet 6 inches periphery pitch.

Her speed, loaded, is 14 miles per hour. Her dead-load capacity on 16 feet draught of water is 2,725 net tons.

During 1890, the Harlem, with her sister, the Hudson, made 27 round trips between Buffalo and Chicago, each carrying 102,300 tons of cargo. Her total shortest sailing distance (by chart) over the route named for 1890, was 48,168 miles. Her ton-mileage for the season was 91,430,000 ton-miles.

OCEAN STEAMSHIP KEWEENAW.

Built of Steel by F. W. WHEELER & CO., at West Bay City, Mich.



She was cut in two on the stocks and launched in two separate sections in order to get through the St. Lawrence River canals to the seaboard. Line on hull shows method of division of the sections.

Tri-compound surface-condensing engines, built by the Frontier Iron Works, Detroit. Cargo capacity, 4,000 tons.